THE ECONOMIC BENEFITS OF THE U.S. DEPARTMENT OF ENERGY FOR THE STATE OF TENNESSEE FISCAL YEAR 2000

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EXECUTIVE SUMMARY

The operations of the U.S. Department of Energy (DOE) provide a major source of economic benefits for the State of Tennessee and its residents through the creation of jobs and income and expansions in state and local tax bases. In order to detail the benefits attributed to DOE operations, the Center for Business and Economic Research at the University of Tennessee, Knoxville, began conducting in-depth analyses of the economic consequences of DOE payroll and non-payroll spending on the State of Tennessee in 1998. The current study provides an analysis of the economic benefits for fiscal year 2000. The results of the current study continue to support DOE's role as a major contributor to Tennessee's economy.

Key findings include the following:

- **Spending by DOE and its contractors led to an increase of nearly $ 1.8 billion in the State of Tennessee's gross state product in 2000.**

- **Total personal income generated in the State of Tennessee by DOE-related activities was nearly $1.2 billion in 2000. Each dollar of income directly paid by DOE in the state translates into a total of $1.87 in personal income for Tennessee residents.**

- **DOE spending supported 33,517 full-time jobs in the state in 2000, meaning that for every one DOE job, 2.2 additional jobs were supported in other sectors of the state economy.**

- **DOE-related spending generated $56.6 million in state and local sales tax revenue in Tennessee in 2000.**

- **DOE operations continue to recruit a highly trained and educated workforce. In 2000, 979 employees held Ph.D degrees, 1,524 held Masters degrees and 2,601 held a Bachelors degree.**

- **Other DOE activities serve to improve the quality of life for Tennesseans. While some enhance the productivity of Tennessee industries and workers, others contribute to the well-being of residents in a more personal manner. For example, DOE, its contractors and their employees donated over $4.6 million to charitable organizations in 2000.**

I. DIRECT BENEFITS OF DOE

DOE spending yields significant direct benefits for the state economy.

- **DOE and its major contractors provided 10,546 full-time jobs in Tennessee in 2000 with annual wages and salaries totaling $504.2 million.**

During 2000, DOE and its major contractors employed 10,546 full-time equivalent employees living in the State of Tennessee and spent more than $504.2 million in payroll expenditures. The jobs are relatively high wage jobs with an average annual salary of $48,009.

- **Total non-payroll spending (or direct procurement spending) by DOE and its contractors totaled nearly $334.2 million in 2000.**

Acquisition of goods and services from Tennessee businesses led to non-payroll spending of $334.2 million by DOE and its contractors. Non-payroll spending generates millions of dollars in new income and supports thousands of jobs in a wide array of sectors in Tennessee's economy.

- **DOE and its contractors paid $7.1 million in state and local sales taxes in 2000.**

As a result of DOE and contractor purchases of goods and services in Tennessee, $5.1 million and $2.0 million were directly contributed to the public coffers of state and local governments, respectively. However, this number understates the total direct benefits to tax revenues resulting from DOE operations because it excludes other forms of tax payments such as payments-in-lieu-of-taxes, and business and property taxes.

II. TOTAL ECONOMIC BENEFITS OF DOE'S DIRECT SPENDING IN TENNESSEE

DOE spending ripples through the state's economy, yielding additional benefits.

- **Tennessee's gross state product increased nearly $1.8 billion in 2000 as a result of direct, indirect and multiplier effects of DOE spending.**

The total output benefit, measured by changes in gross state product from payroll and non-payroll spending by DOE and its major contractors, was nearly $1.8 million in the State of

Tennessee in 2000. The output multiplier was 1.85, meaning that for $1.00 directly spent by DOE in Tennessee, an additional $0.85 of output was produced in other sectors of the economy.

- **DOE activities in Tennessee gave rise to a total income benefit of $1.2 billion in the state in 2000.**

DOE's impact on personal income across the State of Tennessee totaled nearly $1.2 billion in 2000. The income multiplier was 1.87 indicating that for every $1.00 DOE and its contractors spent on wages and salaries, an additional $0.87 in personal income was created for the residents of the state.

- **DOE operations supported 33,517 full-time jobs in the State of Tennessee in 2000.**

The new income generated in Tennessee as a result of DOE operations supported a total of 33,517 jobs in the state. The employment multiplier was 3.18, meaning that for every direct job provided by DOE, an additional 2.18 jobs were supported in other sectors of the state's economy. This relatively high employment multiplier reflects the high average annual salary of DOE-related employees in the state.

- **State and local sales taxes attributed to DOE operations totaled more than $56.6 million in 2000.**

DOE operations give rise to significant increases in sales tax revenue for state and local governments in Tennessee. In 2000, the total state sales tax attributed to the Department was $40.6 million, while local tax coffers benefited by an additional $16.0 million in local sales tax revenue.

Table A: Summary of Economic Benefits of DOE in Tennessee, 2000 (dollars in millions)

Impact	Direct	Total
Output	$ 961.5	$1,776.5
Income	$ 627.3	$1,171.2
Sales Tax	$ 7.1	$ 56.6
Employment	10,546	33,517

III. OTHER BENEFITS AND INITIATIVES[1]

Many of the benefits arising from DOE activities are not easily quantified. At the same time, these broader activities perhaps have an even more important positive impact on the state and its future well-being than the quantifiable economic benefits.

- **DOE, its contractors and their employees donated over $4.6 million in charitable contributions to organizations in Tennessee in 2000.**

- **In 2000, over 2,600 guest researchers generated nearly 8,000 overnight stays in the Knoxville-Oak Ridge area.**

- **The American Museum of Science and Energy drew nearly 126,000 visitors during FY 2000.**

- **The Community Reuse Organization of East Tennessee (CROET) has committed more than $56 million in community transition grant funds to the Oak Ridge region, leading the creation and/or retention of 435 jobs.**

- **Through its Reindustrialization Initiative, DOE has achieved $752 million in cost avoidance and savings while creating 1,222 jobs.**

- **Bechtel Jacobs Company, LLC created Betchel Jacobs Development Company to meet their commitment of creating $427 million in non-DOE-funded payroll in the region over a 5-1/2 contract. More than $137 million of payroll was paid in FY 2000 and the company provided assistance to 61 businesses.**

- **The Spallation Neutron Source, a $1.4 billion facility being built in Oak Ridge, is projected to create up to 1,500 primary and secondary jobs in the region during construction and up to 1,700 primary and secondary jobs in the region during operation.**

THE ECONOMIC BENEFITS OF THE U.S. DEPARTMENT OF ENERGY FOR THE STATE OF TENNESSEE IN 2000

I. INTRODUCTION

Since the U.S. Department of Energy (DOE) first sited its facilities in Tennessee in the 1940s, its operations have made significant contributions to the State of Tennessee, its residents and local governments. DOE's on-going operating budget yields significant benefits to the state economy through the creation of jobs and income, increases in state output and expansions in state and local tax bases. Even though DOE's primary presence in the state is in Anderson and Roane Counties, located in the Knoxville Metropolitan Statistical Area, the economic benefits accrue statewide. The spillover of benefits into the rest of the state can be attributed to the rippling effect of initial economic benefits through supplier firms and vendors as well as the numerous programs offered by the Department to companies located within the state.

The Center for Business and Economic Research (CBER) at The University of Tennessee, Knoxville started conducting an in-depth analysis of the annual economic benefits for Tennessee attributable to the operations of DOE in 1999. The current report represents the third annual study and presents the economic benefits of DOE for fiscal year 2000. The remainder of report consists of three sections. First, the next section provides a brief overview of DOE-related facilities in Tennessee. Section three provides an analysis of the economic benefits for Tennessee in terms of output, income, jobs and sales tax revenue arising from activities of DOE and its major contractors. Section four includes a brief discussion of future directions of DOE and its operations in the State and the final section provides a brief conclusion.

II. PROFILES OF DOE ACTIVITIES[2]

The DOE is present in Oak Ridge in three distinct capacities. First there is the Oak Ridge Operations Office (ORO), which is one of DOE's 10 major field offices. The National Nuclear Security Administration (an independent agency of the DOE) formally began operation on March 1, 2000. ORO and the NNSA use several contractors in the management and operation of their facilities in Oak Ridge. In addition, there is the Office of Scientific and Technical Information (OSTI), which is part of the DOE Headquarters Office of Science but is located in Oak Ridge rather than Washington, D.C

Based in Oak Ridge, Tennessee, the Department of Energy's facilities are rich in history, dating back to World War II when the organization played a major role in the production of materials for the Manhattan Project. Since then, ORO has expanded far beyond that first mission and today is responsible for major DOE programs in science and technology, national security, environmental management and other activities.

The DOE's 34,300 acre Oak Ridge Reservation is located within the City of Oak Ridge in Anderson and Roane Counties. There are three major plant complexes on the Oak Ridge Reservation: the Oak Ridge National Laboratory; the East Tennessee Technology Park; and the NNSA's Y-12 National Security Complex. Also located in the City of Oak Ridge are the Oak Ridge Institute for Science and Education and the American Museum of Science and Energy. Together, these facilities and their capabilities represent a unique technological and educational resource and a major component of the growing East Tennessee Technology Corridor.

Oak Ridge Operations

(http://www.oakridge.doe.gov)

Oak Ridge Operations is responsible for the management and operation of the Oak Ridge National Laboratory and the East Tennessee Technology Park. ORO is also responsible for the Thomas Jefferson National Accelerator Facility in Newport News, Virginia, and the Weldon Spring Site, located near St. Louis, Missouri. The Weldon Spring Site is a former uranium processing facility operated from 1957 to 1966, and is currently undergoing environmental cleanup. In addition, ORO is responsible for the cleanup of legacy wastes created as a result of past operations at the gaseous diffusion plants in Paducah, Kentucky and Portsmouth, Ohio.

Oak Ridge National Laboratory

(http://www.ornl.gov)

ORNL is a multi-program science and technology laboratory managed for DOE by UT-Battelle, LLC. Scientists and engineers at ORNL conduct basic and applied research and development to create scientific knowledge and technological solutions that strengthen the nation's leadership in key areas of science; increase the availability of clean abundant energy; restore and protect the environment; and contribute to national security. ORNL also performs other work for the Department of Energy, including isotope production, information management, and technical program management, and provides research and technical assistance to other organizations. Originally known as Clinton Laboratories, ORNL was established in 1943 to carry out a single,

well-defined mission: the pilot-scale production and separation of plutonium for the World War II Manhattan Project. From this foundation, the Laboratory has evolved into a unique resource for addressing important national and global energy and environmental issues. Today, ORNL pioneers the development of new energy sources, technologies, and materials and the advancement of knowledge in the biological, chemical, computational, physical, engineering, environmental, social and neutron sciences.

Oak Ridge Institute for Science and Education
(http://www.orau.gov/orise.htm)

ORISE has been an integral part of the DOE laboratory system since it was established in 1946 as the Oak Ridge Institute for Nuclear Studies. Today, ORISE and its programs are operated by Oak Ridge associated Universities (ORAU) with a diverse array of complementary, and often unique, programs including: science education programs; research and training in workforce health, safety, and security; emergency preparedness and response; cleanup verification and radiological site characterization; technical training systems; and integrated scientific and technical expertise.

For more than 50 years, ORISE has administered research participation and fellowship programs for the Department of Energy and other federal agencies. Programs target faculty, postgraduates, graduates, and undergraduates in the fields of science, mathematics, and engineering. These programs offer participants the opportunity to work in state-of-the-art research facilities and encourage collaboration among researchers in academia and the national laboratories. ORISE also operates several world-renowned facilities, including the Radiation Emergency Assistance Center/Training Site, the Radiation Internal Dose Information Center, and the Center for Epidemiologic Research. Nationwide, several ORISE programs hold excellent reputations for their expertise: the Environmental Survey and Site Assessment Program, the Center for Human Reliability Studies, the Emergency Management Laboratory, and the Environment, Safety, and Health Group.

East Tennessee Technology Park
(http://www.ettpreuse.com)

The East Tennessee Technology Park (ETTP) is getting a second life through a unique process called Reindustrialization. Parts of the vast complex are available for lease. Facilities, equipment, and reusable materials are available to companies interested in leasing, performing cleanup work, or recycling. ETTP is actually home to two distinct business centers - Heritage Center and Horizon Center. Heritage Center is a former gaseous diffusion facility encompassing 125 main buildings. Businesses locating at Heritage Center often rehabilitate space in these buildings for reduced lease rates and make use of existing machinery and other assets to reduce their operating costs. In contrast, Horizon Center is a new 1,000-acre greenfield site. The site is designed to provide building sites and amenities desired by high-tech companies while still preserving the area's scenic beauty.

Wackenhut Services Incorporated

In January 2000 DOE/ORO contracted with Wackenhut Services, Incorporated (WSI) to provide protective services for the Oak Ridge Complex. WSI brought to this contract a team comprised of three small businesses: PAI Corporation; Critique, Inc.; and NCI. Under this contract the WSI-OR team provides physical, information and personal protective services for Y-12 National Security Complex, Oak Ridge National Laboratory, East Tennessee Technology Park and the Federal Office Building Complex. (These services were previously provided by Lockheed Martin Energy Systems under contract with DOE/ORO.) The WSI-OR team employs approximately 576 Tennesseans who protect the DOE's Oak Ridge resources.

National Nuclear Security Administration, Y-12 Area Office

(http://www.oro.doe.gov/nnsa/)

The NNSA carries out the national nuclear security responsibilities of the DOE. These responsibilities include maintaining a safe, secure, and reliable stockpile of nuclear weapons and associated materials capabilities and technologies; promotion of international nuclear safety and nonproliferation; and administration and management of the naval nuclear propulsion program. As required by the National Defense Authorization Act for Fiscal Year 2000, the national security functions and activities performed by certain elements of the DOE were transferred to the NNSA. Management responsibility for operations at the Y-12 National Security Complex (formerly known as the Y-12 Plant) transferred to the Y-12 Area Office (YAO) under the National Nuclear Security Administration. ORO provides a variety of services to the YAO as part of a service agreement between the two DOE organizations.

Y-12 National Security Complex

(http://www.y12.doe.gov/ .index.html/)

The DOE's National Security mission in Oak Ridge is carried out at the Y-12 National Security Complex, formerly known as the Oak Ridge Y-12 Plant. Operated by BWXT Y-12, LLC, for the DOE, the Y-12 National Security Complex is a manufacturing facility that plays an integral role in DOE's Nuclear Weapons complex. Programs at Y-12 include manufacturing and reworking nuclear weapon components, dismantling nuclear weapon components returned from the national arsenal, serving as the nation's storehouse of special nuclear materials, and providing special production support to other programs. The Y-12 National Security Complex, was part of the Manhattan Project. Its job was to process uranium for the first atomic bomb. Construction of Y-12 started in February 1943; enriched uranium production started in November of the same year. For more than 50 years, Y-12 has been one of the DOE's premier manufacturing facilities. Every weapon in the stockpile has some components manufactured at the Y-12 National Security Complex. Today, the Department of Energy's Y-12 National Security Complex is a manufacturing facility that stretches over 811 acres. Its approximately 700 buildings contain about 7.6 million square feet of floor space.

The Office of Scientific and Technical Information (http://www.osti.gov)

As one of the major science agencies, the DOE manages a $7.5 billion annual investment in R&D. The key benefit of this investment is knowledge, which is recorded in technical reports, scientific journals or preprints. DOE's Office of Scientific and Technical Information (OSTI), as part of the DOE Headquarters Office of Science, supports the agency's R&D mission by collecting, preserving and disseminating this information to Departmental researchers and ensures its accessibility to the public and academia. OSTI is DOE's leader of e-Government initiatives for disseminating information resulting from DOE's R&D program. Using digital technology, OSTI has developed a set of internet-based information products for scientific and technical information. Collectively, these systems constitute a virtual library that focuses on energy, science and technology. As a result of OSTI's advances using information technology in putting full-text research information on the Internet, it serves literally hundreds of thousands more people than it did only five years ago. This is the primary responsibility OSTI- to ensure that the Department and taxpayers receive a return on their research investment in the form of accessible information.

OSTI's mission applies not only to current information but also to a repository of 1.5 million technical reports dating back to the 1940s. In addition, OSTI's mission applies to classified and sensitive information. OSTI provides a secure, active repository of 100,000 classified documents resulting from weapons research.

Also, on behalf of DOE, OSTI represents the United States in two international information exchanges-the International Nuclear Information System, under the auspices of the United Nations' International Atomic Energy Agency, and Energy Technology Data Exchange, under the auspices of the International Energy Agency.

What DOE Facilities Offer Tennessee

The presence of DOE and its contractors in Tennessee gives rise to many benefits, both quantitative and qualitative. Obviously, the facilities discussed above provide employment and income for residents of the state. The jobs provided are most often high-skilled, high-paying jobs resulting in a high quality workforce comprised of some of the top researchers in their field. The presence of DOE also provides the state with national recognition as a leader in manufacturing, advanced materials, neutron sources, biological sciences and transportation technologies. With its R&D capacity and technology sharing programs, DOE plays a significant role in enhancing Tennessee's competitive position in attracting private firms to locate within the state. In addition, DOE is active in bringing federal research grant money to the state and its institutions of higher education. The DOE facilities provide an excellent resource to the University of Tennessee through expanded research capabilities and academic programs. The remainder of the report details the more easily quantifiable economic benefits attributed to the operations of DOE supported facilities in Tennessee and enumerates important qualitative benefits to households, firms and workers.

III. JOB, INCOME, OUTPUT AND SALES TAX BENEFITS OF DOE IN TENNESSEE IN 2000

DOE Expenditure Data

The data used as input into the economic impact model consisted of detail expenditure data for the 2000 fiscal year and were provided by the DOE and its major contractors. Field offices of DOE located outside the state but with expenditures in Tennessee provided the Oak Ridge Operations Office with the detail of those expenditures. Omitted are the contributions of smaller contractors, credit unions and federal retirees. Therefore, the benefits detailed below represent a conservative estimate of the actual benefits attributable to DOE's presence in Tennessee.

Steps were taken in the data collection process to prevent the double counting of contracted and sub-contracted spending. Expenditures were disaggregated into 36 major sectors for input into the model (see Table 1). The total direct payroll and non-payroll spending in Tennessee for fiscal year 2000 was $838.4 million, with an additional $123.1 million in pension disbursements to retirees of DOE funded contractors residing in the state. Payroll spending comprised the largest portion of DOE spending, accounting for $504.2 million or 76.5 percent of the total spending in Tennessee. Other major categories of spending include business services and engineering and management services.

DOE contracts out the vast majority of their operations to private companies. The two largest DOE contracts in Tennessee in 2000 were for Lockheed Martin Energy Systems and UT-Battelle for the operation of the Y-12 Plant and Oak Ridge National Laboratory, respectively. Together these two contractors account for $545.7 million or 71.3 percent of the total DOE-related expenditures in Tennessee. Other prominent DOE contractors in Tennessee include Bechtel Jacobs Company, LLC, Wackenhut Services, Incorporated and Oak Ridge Associated Universities.

Table 1: DOE-Related Expenditures in Tennessee by Sector, 2000

Sector	Expenditures (in dollars)
Farm products and agricultural, forestry and fishing	42,000
Construction	2,538,300
Food and kindred products and tobacco products	3,000
Apparel and other textile products	1,486,600
Paper and allied products	952,900
Printing and publishing	107,500
Chemicals, allied, petroleum and coal products	1,093,900
Rubber and misc. plastics products, leather products	0
Lumber and wood products and furniture and fixtures	80,000
Stone, clay and glass products	293,500
Primary metals industry	4,300
Fabricated metals products	1,250,800
Industrial machinery and equipment	14,164,300
Electronic and other electrical equipment	4,395,700
Other transportation equipment	148,100
Instruments and related products	3,572,500
Miscellaneous manufacturing industries	15,835,900
Transportation	1,641,000
Communication	3,511,200
Electric, gas, and sanitary services	2,973,800
Wholesale trade	11,004,400
Retail trade	6,533,200
Depository and non-depository institutions	39,000
Insurance	222,000
Real Estate	4,706,600
Hotels and other lodging places, recreation services	132,200
Personal and repair services (except auto)	132,000
Business services	83,734,300
Eating and drinking places	36,800
Health services	76,394,993
Legal services	23,900
Engineering and management services	76,798,600
Miscellaneous services	10,275,600
Payroll and Pensions	627,355,178
Metal mining	1,700
Motor vehicles	464,500
Total Tennessee Expenditures	**$961,537,065**
Total Non-payroll Expenditures	**$334,181,887**

Economic Benefits of DOE in Tennessee in 2000[3]

Summary of Benefits

Direct benefits of DOE in Tennessee in fiscal year 2000 include $504.2 million in payroll spending, $334.2 million in non-payroll spending, $123.1 million in pensions, $7.1 million in state and local sales tax and 10,546 full-time jobs. This initial injection of money works its way through the state's economy to produce even more substantial impacts via indirect and multiplier effects. Total economic benefits of DOE spending in Tennessee include a $1,776.5 million increase in output or gross state product, a $1,171.2 million increase in personal income, $56.6 million in state and local sales tax revenue and the support for a total of 33,517 full-time equivalent jobs. A summary of the economic benefits to the State of Tennessee that can be attributed to the presence of DOE for fiscal year 2000 is presented in Table 2. A complete discussion of the output, income, sales tax and employment benefits is presented in the following sections.

Table 2: Summary of Economic Benefits of DOE in Tennessee, 2000

Output	$ 1,776.5 million
Income	$ 1,171.2 million
Sales Tax Revenue	$ 56.6 million
Employment	33,517 FT jobs

Output Benefits

DOE's output benefit for fiscal year 2000 – measured as the increase in gross state product resulting from its expenditures within the state - totaled more than $1,776.5 million. This total includes all direct, indirect and multiplier effects on output attributed to DOE activities. Table 3 provides a breakdown of the total benefit by initial spending source. The leading source of output benefits was payroll spending which accounted for nearly $874.6 million or 49 percent of the total output effect. Non-payroll spending contributed an additional $724.4 million (41 percent of the total effect) to output and pension disbursements and visitor spending provided the remaining increases. As a result of the spending and re-spending in the state's economy, DOE expenditures resulted in an output multiplier of 1.85, meaning that for every dollar spent by DOE, Tennessee's gross state product is increased by $1.85.

Table 3: DOE Output Benefit in Tennessee by Source, 2000 (in millions)

Payroll Spending	$ 874.6
Non-payroll Spending	$ 724.4
Pension Disbursements	$ 171.6
Visitor Spending	$ 5.9
Total Output	**$ 1776.5**

Income Benefits

Total income in the State of Tennessee increased by more than $1,171.2 million in 2000 as a result of DOE spending in the state. As presented in Table 4, the total income

benefit can be divided between direct and indirect/multiplier effects. Direct income effects accrue as a result of spending on wages, salaries and pension disbursements. In 2000, these effects accounted for more than $627.3 million. Indirect effects on income result from several sources including DOE purchases of goods and services in other sectors of the economy, visitor spending and the effect of DOE payroll and pension spending rippling through the economy. In 2000, the indirect and multiplier income benefits of DOE totaled more than $543.9 million. Of all the spending categories, payroll spending had the largest indirect effect as it gave rise to $252.0 million in additional income. Non-payroll spending was the second largest contributor to the indirect income effect as it resulted in nearly a $240.6 million

Table 4: DOE Income Benefit in Tennessee by Source, 2000 (in millions)

Direct Effects	
Payroll Spending	$ 504.2
Pensions	$ 123.1
Indirect/Multiplier Effects	
Non-payroll Spending	$ 240.6
Visitor Spending	$ 1.8
Payroll Spending	$ 252.0
Pensions	$ 49.5
Total Income Benefit	**$1,171.2**

increase in income for residents of the state. The remaining $51.3 million in indirect income benefits are attributed to pension disbursements and visitor spending. The overall personal income multiplier, which is calculated by dividing the total income benefit by direct spending on income, was 1.87. In other words, every dollar of income paid directly by DOE results in the creation of $1.87 in total state income.

Employment Benefits

The total employment benefit of DOE-related expenditures in Tennessee for fiscal year 2000 was 33,517 full-time equivalent jobs. The direct employment of DOE and its contractors in the state was 10,546. A decomposition of direct employment by DOE offices and contractors is provided in Table 5. The two largest DOE-related employers were UT-Battelle and Lockheed Martin Energy Systems with 4,070 and 4,068 Tennessee-based full-time equivalent employees, respectively. Together, these two contractors account for over 77 percent of the total direct employment of DOE in Tennessee. In addition to the more than ten thousand jobs directly created by DOE, 22,971 additional jobs were supported through the purchase of goods and services within the state and through visitor spending and the induced effects of DOE employees spending their income within the state. A breakdown of the employment impacts by source is provided in Table 6. Induced effects from payroll spending gave rise to the largest employment benefit, supporting 11,481 full-time equivalent jobs (34.3 percent of the total benefit) in Tennessee. Non-payroll spending also played a significant roll in supporting jobs as it accounted for 30.5 percent (10,028 jobs) of the employment impact.

The employment multiplier for DOE-related activities in Tennessee for fiscal year 2000 is 3.18 which means that for every job directly created by

DOE an additional 2.18 jobs are supported throughout the state. The resulting employment multiplier is notably higher than for most other industries, suggesting that DOE-related activities have a larger capacity to support jobs. The basis for the increased impact on employment from DOE expenditures relative to other industries is the higher than average salary of $48,009 received by DOE-related employees.

Table 5: DOE Direct Employment Benefit in Tennessee by Entity, 2000 (in full-time equivalent jobs)

UT-Battelle	4,070
LMES	4,068
Bechtel Jacobs	786
Wackenhut	576
DOE-ORO	445
ORAU	443
OSTI	81
DOE, Albuquerque	77
Total Direct Employment	**10,546**

Table 6: DOE Employment Benefit in Tennessee by Source, 2000

Direct Effects	
DOE Employees	10,546
Indirect/Multiplier Effects	
Payroll Spending	11,481
Non-Payroll Spending	10,028
Pensions	907
Visitor Spending	555
Subtotal	22,971
Total	**33,517**

Sales Tax Revenue

The total contribution of DOE-related activities to state and local sales tax revenue in the State of Tennessee for fiscal year 2000 is estimated to be $56.6 million. Of that total, 72 percent or $40.6 million accrues to the state's sales tax coffers and the remaining 28 percent or $16.0 million accrues to local governments. The contribution of DOE on state and local sales tax revenue arises from several sources. First, there is the direct payment of sales tax by DOE and its contractors. Additional taxes are paid by DOE-related employees as they spend their income, as well as visitors to DOE facilities as they make purchases during their stay. Finally, taxes accruing from the activities of businesses and workers supported through direct, indirect, and multiplier-generated income can be attributed to DOE. Table 7 provides a breakdown of the sales tax benefit by source. In addition to sales taxes, DOE-related activities give rise to other fiscal benefits for state and local governments such as payments-in-lieu-of-taxes,property taxes and business taxes. The current study limits its analysis to sales tax revenue. For this reason, the fiscal benefit of DOE in Tennessee is significantly larger than the sales tax benefit detailed in this section.

Table 7: DOE Sales Tax Revenue Benefit in Tennessee by Source, 2000 (in millions)

Direct Payments	
State	$ 5.1
Local	$ 2.0
Indirect/Multiplier	
Payroll Spending	$ 18.8
Non-Payroll Spending	$ 5.6
Pensions	$ 4.6
Visitor Spending	$ 0.2
Multiplier	$ 20.3
Total	**$ 56.6**

Table 8: DOE Community Charitable Contributions by Entity, 2000 (in thousands)

DOE-ORO	
United Way, CFC, etc.	$ 50.9
DOE-ORO Subtotal	*$ 50.9*
UT-Battelle	
Corporate Contributions	$ 660.8
United Way, CFC, etc.	$ 694.0
Donation of Equipment	$ 20.0
UT-Battelle Subtotal	*$ 1,374.8*
LMES	
Corporate Contributions	$ 653.3
United Way, CFC, etc.	$ 41.6
Charitable Contributions	$ 298.8
Educational Contributions	$ 348.0
LMES Subtotal	*$ 1,341.7*
Wackenhut	
Corporate Contributions	$ 16.1
United Way, CFC, etc.	$ 7.8
Charitable Contributions	$ 7.4
Wackenhut Subtotal	*$ 31.3*
Bechtel Jacobs	
United Way, CFC, etc.	$ 203.5
Charitable Contributions	$ 983.5
Educational Contributions	$ 8.7
Bechtel Jacobs Subtotal	*$ 1,195.7*
ORAU	
Corporate Contributions	$ 95.7
United Way, CFC, etc.	$ 38.0
Donation of Equipment	$ 477.3
ORAU Subtotal	*$ 611.0*
OSTI	
United Way, CFC, etc.	$ 11.1
Donation of Equipment	$ 3.1
OSTI Subtotal	*$ 14.2*
Total Contributions	**$ 4,619.6**

Additional DOE Contributions to Tennessee

In addition to the obvious economic benefits of DOE's presence in the state, there exist many avenues by which DOE and contractors contribute to the state's economy and well-being through the many different programs it offers. These programs include community involvement, technology partnerships which result in the establishment of new businesses and technical assistance to Tennessee firms, contributions to Tennessee educational institutions, reuse of government assets, DOE grants and job creation initiatives to offset the downsizing of government operations in East Tennessee. These DOE-supported programs have been instrumental in reshaping the state's economy by leading to new products and processes, and improving overall well-being and competitiveness of the state's industrial base.

One of the more personal ways in which DOE benefits the community at large is through charitable contributions. DOE, its contractors and their employees made significant contributions to charitable causes in 2000 (see Table 8). The donations

ranged from local United Way campaigns to donations of equipment to area schools. In total, over $ 4.6 million in charitable contributions can be directly attributed to DOE operations in Tennessee. Of course, community involvement extends beyond monetary donations as staff and employees of these firms are active in civic organizations and volunteer programs. Therefore the figures presented in Table 8 understate the overall charitable benefits of DOE and its contractors.

IV. NEW DIRECTIONS FOR THE FUTURE[4]

Several existing and future DOE programs hold the prospects of maintaining DOE's technological leadership and economic contributions in the State of Tennessee. DOE anticipates that efforts to mitigate the impacts of downsizing plus new initiatives will provide employment and economic growth and diversification opportunities for the region. Programs to help transition the community include reindustrialization and support for CROET. New initiatives include the Spallation Neutron Source and the Center for Entrepreneurial Growth. This section of the report provides a brief discussion of these programs.

Reindustrialization

ORO leverages valuable but unused assets to accomplish accelerated cleanup, reduce environmental risk and create private sector jobs to compensate for the expected loss of jobs as cleanup is completed. Through the Reindustrialization Program, DOE has achieved $752 million in cost avoidance and savings. A total of 6,331,921 square feet of plant floor space has been transitioned via innovative contracting and leasing models, with the added benefit of creating 1,222 jobs. Much of DOE's effort in this program has been focused on cleaning up formerly used buildings at Heritage Center for reuse by commercial companies that will diversify the local economy. The Community Reuse Organization of East Tennessee acts as the leasing agent for Reindustrialization properties and has consummated 69 leases with over 35 diverse companies at Heritage Center and Oak Ridge National Laboratory.

The Reindustrialization Program also includes a technology transfer component that is focusing on commercializing technology developed in the gaseous diffusion program. The Inorganic Membrane Technology Laboratory is successfully providing technologies in the field of inorganic membranes for commercial use. Thus far ten inorganic membrane products have been approved for commercial manufacture.

Community Reuse Organization of East Tennessee (http://www.croet.com)

Through September 2000, DOE had committed $56 million in community transition grant funds to the Oak Ridge region. During FY 2000, DOE grants to CROET totaled $6.8 million. The funds were used for a variety of programs including training assistance, loans to businesses, development of new and existing industrial parks and grants to local governments for new economic development projects. The Community Reuse Organization of East Tennessee (CROET) reported that 435 jobs were

created or retained during FY 2000 as a result of this funding. During FY 2000, CROET distributed nearly $500,000 in grants that leveraged regional funding towards economic diversification efforts.

As an alternative to locating at Heritage Center, CROET can offer incoming companies the option of locating at the Horizon Center, a greenfield business park adjacent to Heritage Center that is nearing completion of Phase I. CROET's first tenant in Horizon Center is a medical isotope company which has constructed a $30 million facility that will house upwards of 240 workers who will produce a revolutionary and highly successful cancer therapy treatment.

Bechtel Jacobs Company, LLC

As part of its contract with ORO for environmental management, Bechtel Jacobs committed to spend corporate funds to create $427 million of non-DOE-funded payroll in Anderson, Roane, Knox, Blount, and Loudon Counties over a 5-1/2 year contract. A separate division, Bechtel Jacobs Development Company was established to meet these commitments. More than $137 million of payroll was paid during FY 2000 and the company provided assistance to 61 companies. Bechtel Jacobs Development Company works closely with a wide variety of regional economic development agencies to create new payroll through a combination of growing local businesses, attracting businesses to the area and stimulating new businesses.

Center for Entrepreneurial Growth

The Center for Entrepreneurial Growth (CEG) was initiated during FY 2000 as a partnership between ORNL and Technology 2020. Technology 2020 will operate CEG, which focuses on the special needs of new businesses utilizing technologies developed at ORNL. UT-Battelle is providing $1 million in financial support to the CEG over five years along with an additional $100,000 to establish a CEG commercialization fund which will be used to help commercialize ORNL technologies. ORNL reports that since opening in July 2000, CEG has served the needs of ten entrepreneurial businesses with others awaiting evaluation by the CEG.

The Spallation Neutron Source

The Spallation Neutron Source (SNS), a $1.4 billion neutron-scattering research facility being constructed in Oak Ridge, will be used by resident and guest scientists to explore the structure of materials – from plastics to proteins. The SNS is estimated to create up to 1,500 and 1,700 primary and secondary jobs in the region during construction and operation, respectively. Further, it is estimated that the SNS will attract 1,000 to 2,000 guest scientists per year. These new jobs and visiting scientists will significantly add to sales tax revenues for the State of Tennessee. In support of the SNS, the State has committed $8 million for construction of the Joint Institute for Neutron Sciences, a facility to support visiting researchers. The SNS project is a partnership with five other DOE national laboratories that collectively contribute the nation's best capabilities in design and construction of this neutron research facility.

V. CONCLUSION

DOE has been a major contributor to the economy of East Tennessee and the State as a whole since its initial presence in the 1940s. The benefits reaped by the state are both quantitative and qualitative. Quantitative benefits include expansions in income, output, employment and tax revenue. For FY 2000, the presence of DOE led to the creation of nearly $1.8 billion in gross state product, $1.2 billion in personal income and over 33,500 full-time equivalent jobs for residents of Tennessee. In addition, state and local governments benefited from the generation of $56.6 million in sales tax revenue. While these quantitative benefits are significant, perhaps the most important investment in the well-being of the state in the present and the future is the vast array of other activities supported through DOE.

DOE-related programs enhance the welfare of the residents of Tennessee by supporting the economic development of the state and region. DOE contributes to the overall productivity and competitiveness of business and industry in Tennessee and improves the quality of its workforce through its technology partnerships, educational opportunities, community assistance programs and regional initiatives. Many of these programs are aimed at creating new jobs by attracting businesses to the state, helping to build on Tennessee's economic advantages. While it is not possible to accurately quantify the total benefits in terms of income, jobs or tax revenue, it is evident that these programs significantly enhance the prosperity of the Tennessee regional economy.

[1] Information for this section, including number of jobs and benefits, provided by DOE.
[2] Profiles provided by DOE.
[3] It is important to note that the benefits detailed in this report include only those arising from the contractors specifically mentioned. DOE has additional contracts with Tennessee businesses that are not included in the current analysis.
[4] Descriptions, including job calculations, provided by DOE.